

CLAIMS

1. A hydraulic pump apparatus comprising:

an end cap having a plurality of sides, a first surface formed between the sides and having a pump running surface formed thereon, and a second surface formed opposite to the first surface;

a hydraulic pump rotatably mounted on the pump running surface and engaged to and driven by a pump input shaft;

a pair of system ports formed on a first side of the end cap; and

a first case drain formed on a second side of the end cap and a second case drain formed on a third side of the end cap, where the third side is opposite to the second side.

2. A hydraulic pump apparatus as set forth in Claim 1, further comprising a bypass port formed in a fourth side of the end cap, where the fourth side is opposite to the first side.

3. A hydraulic pump apparatus as set forth in Claim 2, where the bypass port is formed in the end cap parallel to one of the system ports.

4. A hydraulic pump apparatus as set forth in Claim 1, further comprising a valve plate mounted between the pump running surface and the hydraulic pump.

5. A hydraulic pump apparatus as set forth in Claim 1, further comprising a first check orifice formed in the second side of the end cap.

6. A hydraulic pump apparatus as set forth in Claim 5, further comprising a second check orifice formed in the third side of the end cap.

7. A hydraulic pump apparatus as set forth in Claim 6, wherein the first check orifice is formed directly opposite to the second check orifice in the end cap.

8. A hydraulic pump apparatus as set forth in Claim 1, wherein the hydraulic pump comprises a rotatable cylinder block having five pistons mounted therein.

5 9. A hydraulic pump apparatus as set forth in Claim 1, wherein the second surface of the end cap forms an external surface of the pump apparatus.

10. A hydraulic pump apparatus as set forth in Claim 1, wherein the pump input shaft extends through the end cap.

11. A hydraulic pump apparatus comprising:

10 a pump housing forming a sump;

a hydraulic pump mounted in the sump and engaged to and driven by a pump input shaft;

and

an end cap engaged to the housing and comprising an opening to receive the pump input shaft and a pump running surface on which the hydraulic pump is mounted, wherein the end cap
15 is symmetric about a first plane extending parallel to and through the pump input shaft.

12. A hydraulic pump as set forth in Claim 11, further comprising a swash plate engaged to the hydraulic pump to control the output thereof, and a trunnion arm engaged to the swash plate, wherein the trunnion arm extends from the pump assembly perpendicular to the first plane.

13. A hydraulic pump apparatus as set forth in Claim 12, wherein the hydraulic pump
20 comprises a rotatable cylinder block having five pistons mounted therein.

14. A hydraulic pump apparatus as set forth in Claim 13, wherein the pump input shaft extends through the end cap.

15. A hydraulic pump apparatus comprising:

an end cap;

5 a hydraulic pump rotatably mounted on the end cap and engaged to and driven by a pump input shaft; and

first and second system ports formed in the end cap; and

first and second case drains formed in the end cap, wherein both system ports are on opposite sides of a first plane extending through the end cap parallel to and through the pump
10 input shaft, and both system ports are on one side of a second plane extending through the end cap parallel to and through the pump input shaft and perpendicular to the first plane, and both case drains are on the other side of the second plane.

16. A hydraulic pump apparatus as set forth in Claim 15, further comprising a first bypass valve passage formed in the end cap parallel to one of the system ports.

15 17. A hydraulic pump apparatus as set forth in Claim 16, further comprising a first check valve passage formed in the end cap perpendicular to the first bypass valve passage.

18. A hydraulic pump apparatus as set forth in Claim 17, further comprising a second check valve passage formed in the end cap perpendicular to the first bypass valve passage.

19. A hydraulic pump apparatus as set forth in Claim 18, wherein the first check valve
20 passage is collinear with the second check valve passage.

20. A hydraulic pump apparatus as set forth in Claim 15, wherein the hydraulic pump comprises a rotatable cylinder block having five pistons mounted therein.

21. A hydraulic pump apparatus as set forth in Claim 15, further comprising first and second kidneys formed on the pump running surface, wherein the first kidney is in communication with the first system ports and the second kidney is in communication with the second system port, and the two kidneys are on opposite sides of the first plane.

22. An end cap for a hydraulic pump apparatus comprising: at least two system ports for connection to a hydraulic motor; at least two check valves; and at least two case drains, where the case drains are located on opposite sides of the end cap.

23. A drive apparatus for a vehicle having two sides, the drive apparatus comprising:
a first pump having a first movable swash plate and at least two system ports extending in a first direction and a first bypass valve extending in a second direction which is parallel to and opposite from the first direction;

a first trunnion arm engaged to the first swash plate and extending in a third direction towards one of the sides of the vehicle, where the third direction is perpendicular to the first and second directions;

a second pump having a second movable swash plate and at least two system ports extending in the first direction and a second bypass valve extending in the second direction; and

a second trunnion arm engaged to the second swash plate and extending in a fourth direction towards the other of the side of the vehicle, where the fourth direction is parallel to the third direction.

24. A drive apparatus as set forth in Claim 23, wherein the first pump further comprises a first case drain opening toward the fourth direction and the second pump comprises a second case drain opening toward the third direction.

25. A drive apparatus as set forth in Claim 23, wherein the first pump further comprises a first end cap having a first pump running surface formed thereon for rotatably mounting the first cylinder block..

26. A drive apparatus as set forth in Claim 25, wherein the second pump further comprises a second end cap having a pump running surface formed thereon for rotatably mounting the second cylinder block.

27. A vehicle as set forth in Claim 26, further comprising a first valve plate mounted between the first pump running surface and the first cylinder block and a second valve plate mounted between the second pump running surface and the second cylinder block.

28. A vehicle as set forth in Claim 23, wherein the first direction is towards the front of the vehicle.

29. A vehicle as set forth in Claim 23, wherein the first pump is located in a housing mounted on the vehicle frame on one side of the vehicle and the second pump is located in a second housing mounted on the vehicle frame on the other side of the vehicle opposite the first side.